

In The Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (currently amended) A rotary disk refiner for refining fiber in a liquid stock comprising:
a housing having a stock inlet;
a rotor within the housing that rotates about an axis of rotation during operation and
which has a first refiner plate mounting surface;
a second refiner plate mounting surface within the housing that opposes the rotor;
a first refiner plate carried by the first refiner plate mounting surface, the first refiner plate comprised of a plurality of pairs of upraised refiner bars that define grooves therebetween that collectively form a first refining surface;
a second refiner plate carried by the second refiner plate mounting surface, the second refiner plate comprised of a plurality of pairs of upraised refiner bars that define grooves therebetween that collectively form a second refining surface, wherein the second refiner plate opposes and is spaced from the first refiner plate, and wherein a refining zone is defined between the opposed refining surfaces of the first and second refiner plates; ~~and~~
wherein one of the refiner plates has one portion of its refining surface that is movable relative to another portion of its refining surface with the one portion of the refining surface and the another portion of the refining surface being angularly fixed during refining fiber; and
wherein the portion of the refining surface is movable relative to the another portion of the refining surface such that the angle of the refiner bars of the one portion of the refining surface relative to the angle of refiner bars of the another portion of the refining surface is changeable.
2. (canceled)

3. (previously presented) The rotary disk refiner of claim 1 wherein the one portion of the refining zone is moveable such that it is axially displaceable relative to the another portion of the refining zone.
4. (previously presented) The rotary disk refiner of claim 3 further comprising a biasing element disposed behind the one portion of the refining zone that is compressible, the biasing element permitting axial displacement of the first portion of the refining surface relative to the another portion of the refining surface.
5. (previously presented) The rotary disk refiner of claim 4 wherein the biasing element comprises a spring.
6. (previously presented) The rotary disk refiner of claim 5 wherein the biasing element comprises a coil spring that is disposed between the one portion of the refining surface and the first and second refiner plate mounting surfaces carrying the one of the refiner plates.
7. (previously presented) The rotary disk refiner of claim 6 wherein the one of the refiner disks is removably mounted by fasteners to one of the refiner plate mounting surfaces.
8. (canceled).

9. (previously presented) The rotary disk refiner of claim 1 wherein the one portion of the refining surface is moveable such that (a) it is axially displaceable relative to the another portion of the refining surface, and (b) the angle of its refining surface can be changed relative to the refining surface of the another portion thereby changing the angle of its refiner bars relative to the angle of the refiner bars of the refining surface of the another portion, and wherein changing of the angle of the refiner bars of the refining surface of the one portion relative to the angle of the refiner bars of the refining surface of the another portion is resisted during refiner operation.

10. (previously presented) The rotary disk refiner of claim 1 wherein the one portion of the refining surface is moveable such that (a) it is axially displaceable relative to the another portion of the refining surface and (b) the orientation of its refining surface can be changed relative to the refining surface of the another portion.

11. (previously presented) The rotary disk refiner of claim 1 wherein the one portion of the refining surface is moveable such that it is axially displaceable relative to the another portion and has a plurality refiner bars whose angle can be changed relative to the refiner bars on the another portion.

12. (previously presented) The rotary disk refiner of claim 1 wherein the one portion of the refining surface is comprised of an insert that has a plurality of refiner bars.

13. (previously presented) The rotary disk refiner of claim 12 wherein the insert is circular and can be turned to change the angle of the plurality of the refiner bars of the insert relative to the plurality of refiner bars of the another portion of the refining surface.

14. (previously presented) The rotary disk refiner of claim 12 wherein the insert comprises an indexable insert.

15. (previously presented) The rotary disk refiner of claim 14 wherein the indexable insert is shaped like a square, an equilateral triangle, a pentagon, or an octagon.

16. (previously presented) The rotary disk refiner of claim 12 wherein the one of the refiner plates has a pocket that defines a window in the another portion of its refining surface and wherein the insert is received in the pocket and the refining surface of the one portion of the refining surface is defined by the refiner bars of the insert.

17. (previously presented) The rotary disk refiner of claim 16 wherein the insert further comprises a base that is larger than the refining surface of the insert to prevent removal of the insert through the window in the refining surface of the another portion.

18. (previously presented) The rotary disk refiner of claim 16 wherein one of the insert and the one of the refiner plates has a detent and the other one of the insert and the one of the refiner plates has a plurality of spaced apart detent notches that is each capable of receiving a detent when the insert is received in the pocket and permits the insert to be indexed.

19. (previously presented) The rotary disk refiner of claim 16 wherein the insert has a base with a back surface and the refiner bars carried by a front surface, and wherein the insert further comprises a portion that extends outwardly from the base so as to bear against a portion of the one of the refiner plates to oppose removal of the insert through the window.

20. (previously presented) The rotary disk refiner of claim 16 wherein the one of the refiner plates has (a) a front with a front surface that comprises its refining surface and (b) a rear with a rear surface, and wherein the pocket in the one of the refiner plates extends completely through the one of the refiner plates, permitting insertion or removal of the insert from the rear of the one of the refiner plates.

21. (previously presented) The rotary disk refiner of claim 20 wherein the insert has a base with an outwardly extending portion, and adjacent the rear of the one of the refiner plates the pocket comprises an outwardly extending well that receives the outwardly extending portion of the base of the insert with the outwardly extending portion of the base of the insert preventing removal of the insert through the window.

22. (previously presented) The rotary disk refiner of claim 21 wherein the well comprises a counterbore or a countersink.

23. (previously presented) The rotary disk refiner of claim 22 wherein the outwardly extending portion of the base comprises a flange that extends outwardly about the periphery of insert and that engages the one of the refiner disks to prevent removal.

24. (previously presented) The rotary disk refiner of claim 1 wherein the one portion of the refining surface is comprised of an insert that is captured by the one of the refiner disks and the refiner plate mounting surface to which it is mounted.

25. (previously presented) The rotary disk refiner of claim 24 further comprising a biasing element between the insert and the refiner plate mounting surface to which the one of the refiner disks is mounted, wherein the biasing element urges the insert outwardly.

26. (previously presented) The rotary disk refiner of claim 24 further comprising a biasing element between the insert and the refiner plate mounting surface to which the one of the refiner disks is mounted, wherein the biasing element urges the insert outwardly such that the edges of the refiner bars of the insert are substantially flush with the edges of the refiner bars of the another portion of the refining surface.

27. (previously presented) The refiner disk of claim 1 further comprising (a) a plurality of guides that extend axially outwardly, (b) a plurality of bores in the one portion of the refining surface with one of the guides received in one of the bores and another one of the guides received in another one of the bores, and (c) a biasing element disposed rearwardly of the one portion of the refining surface.

28. (previously presented) The refiner disk of claim 27 wherein there are a plurality of the biasing elements with one of the biasing elements carried by one of the guides and another one of the biasing elements carried by another one of the guides.

29. (previously presented) The refiner disk of claim 28 wherein at least one of the guides comprises a fastener that has a head at one end and an axial groove at an opposite end that communicates with a groove that extends transverse to the axial groove.

30. (previously presented) The refiner disk of claim 29 wherein the fastener is disposed in a bore in one of the refiner plate mounting surfaces to releasably mount the one portion of the refining surface to the one of the refiner plate mounting surfaces and wherein there is a finger disposed in the bore that engages the fastener to retain the fastener in the bore.

31. (previously presented) The refiner disk of claim 30 wherein the one of the refiner plate mounting surfaces further comprises a mounting surface of the refiner and a backing plate disposed between the one portion of the refining surface and the mounting surface of the refiner plate.

32. (previously presented) The refiner disk of claim 31 wherein the bore is disposed in the backing plate and the backing plate is attached to the mounting surface of the refiner plate.

33. (previously presented) The refiner disk of claim 28 wherein at least one of the guides comprises a fastener that engages one of the refiner plate mounting surfaces to removably attach the one portion of the refining surface to the one of the refiner plate mounting surfaces.

34. (previously presented) The refiner disk of claim 33 wherein the fastener is disposed in a pocket in the one of the refiner plate mounting surfaces that is defined by a sidewall, and one of the fastener and pocket sidewall has an axial groove that is connected to a transverse groove and the other one of the fastener and the pocket sidewall has detent that is received in the groove to releasably engage the fastener and the one of the refiner plate mounting surfaces.

35. (previously presented) The refiner disk of claim 34 wherein the pocket is disposed in the backing plate and the backing plate is attached to the mounting surface of the refiner.

36. (previously presented) The refiner disk of claim 27 wherein at least one of the guides comprises a fastener that engages one of the refiner plate mounting surfaces to removably attach the one portion of the refining surface to the one of the refiner plate mounting surfaces.

37. (previously presented) The refiner disk of claim 1 further comprising a fastener that has a shank that is disposed in a pocket in one of the refiner plate mounting surfaces, the pocket defined by a sidewall, to removably mount one of the portions of the refining surface to the one of the refiner plate mounting surfaces wherein one of the fastener and the pocket sidewall has a groove with a first axial portion connected to a transverse portion that is connected to a second axial portion groove and the other one of the fastener and the pocket sidewall has a detent that is received in the second axial portion of the groove to releasably engage the fastener with the one of the refiner plate mounting surfaces.

38. (previously presented) The refiner disk of claim 1 wherein the one of the refiner plates is comprised of a plurality of segments that each have an outer annular section that is axially displaceable and an inner annular section that is disposed radially inwardly of the outer annular section and which is axially displaceable.

39. (previously presented) A refiner disk for a rotary disk refiner that refines fiber in a liquid slurry comprising:

an annular plate with a refining surface that has a plurality of pairs of refiner bars extending outwardly therefrom and a pocket that defines a window in the refining surface;

an insert received in the pocket, the insert having a refining surface with a plurality of refiner bars that are adjacent the refiner bars of the plate when the insert is received in the pocket; and

wherein the insert can be rotated relative to the plate to change the angle of the refiner bars of the insert relative to the angle of the refiner bars of the plate.

40. (previously presented) The refiner disk of claim 39 wherein the insert is removably received in the pocket and the refiner bars of the insert are substantially flush with the refiner bars of the plate.

41. (previously presented) The refiner disk of claim 40 wherein the plate is comprised of segments and each segment has a pocket with an insert disposed in the pocket.

42. (previously presented) The refiner disk of claim 39 further comprising a refiner plate mounting surface to which the plate is mounted, wherein the insert is releasably captured between a portion of the plate and the mounting surface.

43. (previously presented) The refiner disk of claim 42 further comprising a spring disposed between the insert and the mounting surface that permits the insert to be displaced toward the mounting surface.

44. (previously presented) The refiner disk of claim 39 wherein the insert is circular and has a base with an outwardly extending portion that interferes with the plate to prevent removal of the insert from the plate.

45. (previously presented) The refiner disk of claim 44 wherein the outwardly extending portion extends about the periphery of the circular insert.

46. (previously presented) The refiner disk of claim 39 wherein the insert is indexable.

47. (previously presented) The refiner disk of claim 45 wherein the pocket is defined by a sidewall and one of the indexable insert and the plate sidewall have a plurality of detents and the other one of the indexable insert and the plate sidewall have a plurality of detent-receiving notches each of which is capable of receiving a detent.

48. (previously presented) The refiner disk of claim 39 wherein the annular plate is comprised of a plurality of segments with one of the segments having a plurality of the inserts.

49. (previously presented) A refiner disk segment for removably mounting to a refiner plate mounting surface of a rotary refiner comprising:

a first section that is axially displaceable relative to the refiner plate mounting surface;

a second section that is axially displaceable relative to the refiner plate mounting surface and relative to the first section; and

wherein the first section is disposed radially outwardly of the second section.

50. (canceled).

51. (previously presented) The refiner disk segment of claim 49 wherein the first section extends annularly from one radial edge of the segment to the other radial edge of the segment and the second section extends annularly from the one radial edge of the segment to the other radial edge of the segment.

52. (previously presented) A segment of a refiner plate for a rotary disk refiner used to refine fibrous matter in a stock slurry, the segment comprising a base and a refining surface carried by the base that is comprised of a plurality of pairs of radially extending refiner bars that define a plurality of grooves therebetween with the refining surface comprised of a section having a plurality of refiner bars that is angularly adjustable relative to a remainder of the refining surface with the angularly adjustable refining surface section being fixed during refining.

53. (previously presented) The refiner plate segment of claim 52 wherein the angularly adjustable refining surface section comprises an insert that is disposed in a pocket in the refining surface and wherein there is engagement between one of the insert and the base to prevent the insert from freeing itself from the base or the refining surface in an axially outward direction.

54. (previously presented) The refiner plate segment of claim 52 wherein the angularly adjustable refining surface section comprises an insert that is disposed in a pocket in the refining surface and that is axially displaceable relative to the remainder of the refining surface during refining.

55. (previously presented) The refiner plate segment of claim 52 wherein the angularly adjustable refining surface section comprises an insert that has a plurality of pairs of elongate refiner bars.

56. (previously presented) The refiner plate segment of claim 52 wherein the angularly adjustable refining surface section comprises an insert carried by the base that is angularly indexable.

57. (previously presented) The refiner plate segment of claim 52 further comprising a fastener that removably anchors the angularly adjustable refining surface section to the base.

58. (previously presented) A segment of a refiner plate for a rotary disk refiner used to refine fibrous matter in a stock slurry, the segment comprising:

- a base having an outer peripheral edge;

- a refining surface carried by the base that is comprised of a plurality of pairs of generally radially extending refiner bars upraised from the base that define a plurality of grooves therebetween;

- a refining surface insert disposed radially inwardly of the outer peripheral edge of the base within a portion of the refining surface, the refining surface insert comprised of a plurality of pairs of upraised refiner bars defining a plurality of grooves therebetween with the insert being angularly rotatable for changing the angle of the refiner bars of the refining surface insert relative to the refiner bars of the refining surface to optimize performance.

59. (previously presented) The refiner plate segment of claim 58 wherein the refining surface insert is angularly adjustable between a plurality of pairs of positions such that the angle of the refiner bars of the refining surface insert changes relative to the refiner bars of the refining surface in tuning performance.

60. (previously presented) The refiner plate segment of claim 59 wherein the refining surface insert is angularly indexable between the plurality of pairs of positions.

61. (previously presented) The refiner plate segment of claim 58 wherein the refining surface insert is axially displaceable inwardly relative to the refining surface.

62. (previously presented) A refiner plate for a rotary disk refiner used to refine fibrous matter in a stock slurry, the refiner plate comprised of a plurality of refiner disk segments that each have a refining surface comprised of a plurality of pairs of upraised refiner bars with a portion of the refining surface being angularly adjustable relative to a remainder of the refining surface with the angularly adjustable portion of the refining surface being angularly fixed during refining.

63. (previously presented) The refiner plate of claim 62 wherein the angularly adjustable portion of the refining surface is axially displaceable relative to the remainder of the refining surface during refining.

64. (previously presented) The refiner plate of claim 62 wherein the angularly adjustable portion of the refining surface is angularly adjustable between a plurality of pairs of positions such that the angle of the refiner bars of the angularly adjustable portion of the refining surface can be varied relative to the refiner bars of the remainder of the refining surface to tune performance.

65. (previously presented) A refiner plate for a rotary disk refiner used to refine fibrous matter in a stock slurry, the refiner plate comprised of a plurality of refiner disk segments that each have a refining surface comprised of a plurality of pairs of upraised refiner bars with a portion of the refining surface being angularly adjustable relative to a remainder of the refining surface between a plurality of pairs of positions to tune refining performance by selecting the position that provides optimum performance.

66. (previously presented) A segment of a refiner plate for a rotary disk refiner used to refine fibrous matter in a stock slurry, the segment comprising:

a base having a refining surface comprised of a plurality of pairs of generally radially extending refiner bars upraised from the base that define a plurality of grooves therebetween and having a pocket in the refining surface;

an angularly adjustable and axially displaceable refining surface insert received in the pocket and engaging the base with the refining surface insert having a plurality of upraised refiner bars.

67. (previously presented) The refiner plate segment of claim 66 wherein the angularly adjustable and axially displaceable refining surface insert is angularly fixed during refining due to friction between the angularly adjustable and axially displaceable refining surface insert and the base.

68. (previously presented) The refiner plate segment of claim 67 further comprising a coil spring underlying the angularly adjustable and axially displaceable refining surface insert and urging the angularly adjustable and axially displaceable refining surface insert against the base.

69. (previously presented) The refiner plate segment of claim 66 wherein the pocket is defined by a sidewall, the insert is defined by a sidewall, one of the pocket sidewall and the insert sidewall comprises a plurality of detents and the other one of the pocket sidewall and the insert sidewall comprises a plurality of detent notches, and the plurality of detents are received in a plurality of the plurality of the detent notches to angularly fix the angularly adjustable and axially displaceable refining surface insert to keep it from angularly moving relative to the refining surface of the base.

70. (previously presented) A segment of a refiner plate for a rotary disk refiner used to refine fibrous matter in a stock slurry, the segment comprising:

- a base having a refining surface comprised of a plurality of pairs of generally radially extending refiner bars upraised from the base that define a plurality of grooves therebetween and having a pocket in the refining surface;

- an angularly adjustable and axially displaceable refining surface insert received in the pocket and engaging the base with the refining surface insert having a plurality of upraised refiner bars; and

- a biasing element underlying the angularly adjustable and axially displaceable refining surface insert and urging the angularly adjustable and axially displaceable refining surface insert outwardly away from a refiner plate mounting surface of the rotary disk refiner.

71. (previously presented) The refiner plate segment of claim 70 wherein the biasing element comprises a coil spring disposed between the refiner plate mounting surface and the angularly adjustable and axially displaceable refining surface insert.

72. (previously presented) A segment of a refiner plate for a rotary disk refiner used to refine fibrous matter in a stock slurry, the segment comprising:

a base having a refining surface comprised of a plurality of pairs of generally radially extending refiner bars upraised from the base that define a plurality of grooves therebetween and having a pocket in the refining surface;

an angularly adjustable and axially displaceable refining surface insert received in the pocket and engaging the base with the refining surface insert having a plurality of upraised refiner bars that are angularly fixed during refining.

73. (previously presented) A segment of a refiner plate for a rotary disk refiner used to refine fibrous matter in a stock slurry, the segment comprising:

a base;

a refining surface that is axially displaceable during refining;

a plurality of spaced apart rotatable fasteners that removably engage the base to removably attach the axially displaceable refining surface; and

a biasing element urging the axially displaceable refining surface away from the base.

74. (previously presented) The refiner plate segment of claim 73 wherein the biasing element comprises a spring carried by each one of the plurality of fasteners wherein the spring is disposed between the axially displaceable refining surface and the base.

75. (previously presented) The refiner plate segment of claim 73 further comprising a plurality of refiner plate segment fasteners that removably attach the base to a refiner plate mounting surface of a rotary disk refiner.

76. (previously presented) The refiner plate segment of claim 73 wherein the base has a plurality of bores formed therein with each bore constructed and arranged to received one of the plurality of fasteners with one of the bore and fastener having a retainer channel with a J-shaped portion formed therein and the other one of the bore and the fastener having a pin extending therefrom that is received in the J-shaped portion of the retainer channel when removably attaching the axially displaceable refining surface to the base.